Winds of Europe.

By Pliny Earle Chase.

(*Read before the American Philosophical Society, June* 16, 1871.)

In my desire to give proper weight to considerations which favor the hypothesis of normal cyclonic currents, I stated in a recent communication to the Society (March 17, 1871), as one of the admitted facts, "that most of the European winds are cyclonic."

Further study has satisfied me that this admission is altogether too liberal, and that, although a majority of the European winds are cyclonic, the majority is not a large one. The daily weather maps of the French "Bulletin International," and the Quarterly Weather Reports of the British Meteorological Office for 1869, seem to show conclusively that in France and Great Britain, anticyclonic are nearly as frequent as cyclonic currents, and that it is only by a discussion of continuous records that the prevailing cyclonism, such as is indicated in the following table, can be demonstrated.

I have deduced the average direction of the winds from the tables in Coffin's "Winds of the Northern Hemisphere." Those marked (C) were computed by Prof. Coffin; the others were obtained by combining, with some regard to weight, the observations which he records for the respective districts.

Mean Direction of European Winds.

Ireland, (2 stations)	N.	86°50′	W.
England (C)	S.	66	"
Scotland, (C)	"	62	"
Sweden, (C)	"	50	"
Norway, (1 station)	"	86 59	"
Denmark, (C)	"	62	"
Denmark, Norway and Sweden	"	62 56	"
Russia	"	52 21	"
" and Hungary, (C)	N.	87	"
Prussia	S.	73 36	"
Germany, (C)	"	76	"
" Southern, (C)	"	82 4	"
Austria	"	64 49	"
Holland and Belgium	"	79 13	"
France and Netherlands, (C)	"	88	"
France, (C)	"	82 50	"
Switzerland	N.	56 54	"
Italy	"	26 43	"

On the Normal Position of the Tidal Ellipsoid.

By Pliny Earle Chase.

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The inferences of Laplace, that for certain depths, and of Airy, that for all depths, on a globe covered with a sea of uniform depth and without

friction, it should be *low water under the moon*, rest on the assumption that δr is so slight (see Mec. Celeste 327 iv, 337 iv, 342, 2177, &c.,) that it may be neglected, in order to satisfy equations which would otherwise be impossible of integration. It is true that the radial coördinate of the tide wave, is insignificant in comparison with the coördinates in latitude and longitude, but the cause of that insignificance is not immediately evident, and I can see no reason for omitting, in tidal discussions, any term which would be important in the discussion of planetary motions.

I presume the following postulates will be readily granted.

I. If the earth had no axial rotation, the tide would be one of equilibrium, with high water under the moon.

II. If rotation were to commence after the establishment of the equilibrium tide, the tidal ellipsoid would be thrown forward in the direction of rotation.

III. If the water flowed with such velocity as to be self-sustained, the centrifugal balancing the centripetal force, it would be low water under the moon.

As neither the first nor the third of these conditions is true, it would seem reasonable to infer that the tidal crest should be at some point intermediate between the lunar meridian and the lunar astronomical horizon. The second postulate favors this inference, provided there is any force, other than friction, which would tend to set back the crest of the third postulate.

Such forces, it seems to me, exist in the cohesive attraction and incompressibility of the water, and the rigidity of the earth, all of which tend to shorten the radius vector and increase the velocity of every particle dm, in two of the quadrants, and to lengthen the radius and diminish the velocity, in the alternate quadrants. These successive increments and decrements of velocity terminate at the octants, thus tending to produce low water three hours before, and high water three hours after, the moon passes the meridian.

Airy (Mo. Notices, R. A. S., April 13, 1866), gives a diagram to show, from the position of the points at which *zero* horizontal currents become *plus* or *minus* currents, that it must be low water under the moon. I am unable to reconcile his hypotheses, respecting the direction and velocity of the currents, with actual tidal observations, but even if they are correct, I think we should look to the total action of the moon, rather than to the flow of water at particular points. The water falls in the entire quadrants immediately following, and rises throughout the quadrants immediately preceding the meridian of high water. Would not this continuous action be best sustained if the moon were on the great circle 45°W. of the crest and 45°E. of the trough of the tidal wave, as Newton suggested in his *Principia*, B. I., Prop. 66, Cor. 20?